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NEW YORK SUGAR MARKET.—No change in rates from January 18 to March 9, 4 1-16 was the quoted price.

Cuba Centrifugals—The visible crop of Cuba has reached 434,663 tons, which is an indication of at least 600,000 tons total crop, notwithstanding the probability that many factories will finish grinding early, and weather conditions continue favorable both for gathering the crop and for the planting. Later advices note an advance of 1-8c.

The stocks in Europe do not disclose a large beet crop, and the conditions there are somewhat similar to those in Louisiana, where in the face of an increase in production equal to 120,000 tons, New Orleans refiners are large buyers of beets and foreign cane, and the excess in the local crop has in some unaccountable manner disappeared in consumption or in the invisible supplies.

Should the demand from China and Japan assume a more general character, the consumption of the product in those countries might possibly absorb all the surplus of the world's production, and Java shippers have already anticipated the possibility of those markets taking the place of the demand from America, as Cuba increases her production.

In Russia every manufacturer of sugar is required by law to export a fixed amount of his product, on which he receives a rebate of one ruble, 85 kopeks per pood, excise tax when exported. There are 280 manufacturers of sugar in Russia, but only 20 of them are refiners. They supply the home market, the refined article being too hard for other countries, it being the habit of the peasant class, the largest consumers of sugar, to hold a lump in their mouths while drinking tea. Russian sugar is said to be 99% pure, and for that reason the best in the world. Russian sugar stocks pay from 15 per cent to 50 per cent dividends annually. There is some demand for Russian sugar in the United States, and some Rus-

sian sugar is reaching the American market. The Russians enjoyed a profitable exporting business, for they were able to send their product to America at half a cent a pound less than the cost of production in America.

Not for many years has the market for citrus fruits been in such a demoralized condition, says an exchange. It is not from one market, but from all that the bad reports come. Fruit arriving in poor condition, caused by delay in transit and delay in shipment, is bringing prices tumbling like a house of cards. All the market reports tell the tale, and some sales are good compared to others. Hundreds of carloads will not pay expenses, let alone a margin to the growers.

Ex-President Grover Cleveland says of Washington: "The study of his life is valuable, not only because it impresses us with the beauty of moral virtues and with examples of sublime accomplishment, but because it portrays the highest possible public service. He furnishes us with a criterion by which we may judge all present and future leaders of the people." And it may be well to bear in mind his saying: "Labor to keep alive in your breast that little spark of celestial fire—conscience."

The Deming process of clarification is being rapidly introduced into Hawaiian sugar factories, and it is not surprising that in every instance where this has been done, the most perfect satisfaction has been given, showing its superiority for doing the most important work required in every sugar house.

TEMPERATURE AND RAINFALL.—Attention is called to the valuable tables, for which we are indebted to Hon. W. R. Castle, that appear in this number, showing the temperature and rainfall in Honolulu for the past year, 1900. The rainfall in Honolulu was 33.25 inches, well distributed through the year. The temperature statistics show 89° as the highest recorded, and 56° as the lowest, with an average of 72° for the year. At more elevated locations on each of the islands, the temperature is much cooler, in some localities, ten or twelve degrees cooler. So with the rainfall, which varies largely on the windward sides and on the high lands, reaching in some localities over 100 inches as an annual average. The moun-

tain streams are rarely dry, and freshets are frequent on the windward slopes, and occasionally occur on the leeward sides also. There are very few countries which enjoy a greater freedom from extremes of heat and cold than Hawaii, and on this account it may be classed as one of the most healthy and desirable resorts that are to be found in any part of the world. The abundance of pure artesian water also favors this group as a desirable residence.

ONLY A HINT.—The newspapers have started a catchy and timely refrain, that seems to possess a genuine popular ring for railroad and steamboat travelers—"Put Me off at Buffalo." It takes with the crowd, whether bound to that attractive center of Pan-American display, or beyond it. Now where's the musical genius, who can produce a stirring song, each verse ending with the refrain "Put Me off at Buffalo?" With an attractive frontispiece or cover, ringing patriotic Pan-American lines, and original music suited to the occasion all copy-righted—a little fortune may be in store for some lucky musician or poet, besides booming the great exhibit at Buffalo. No charge for this suggestion, even if it does come from fair Hawaii, the only paradise of the American Empire, where a few musicians are domiciled.

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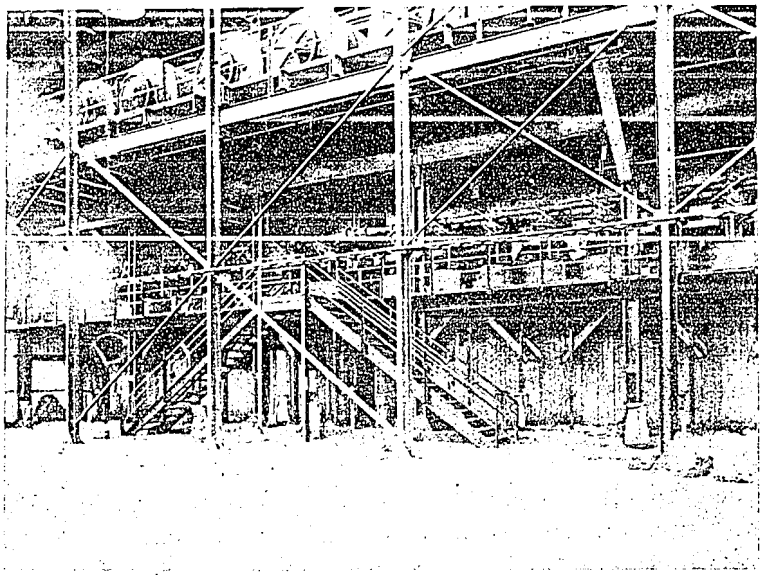
A MODEL SUGAR MILL.

The Honolulu Sugar Plantation, located at Halawa, eight miles from this city, is the newest and has probably the largest mill on the islands. It is owned chiefly by San Francisco capitalists, with Wm. G. Irwin & Co. as their local agents. Since the annexation of these islands, capitalists abroad have unbounded confidence in all sugar investments made here. And well they may have, as Hawaii will hereafter share in all the benefits which the great republic, now forging to the front, as the leading empire in the commercial as well as the political world, secures to her citizens, be they native born or foreign.

On the site where this plantation is now located, a small sugar farm and mill were started some forty years ago by a Mr. Williams, who recognized in it the right spot for such an enterprise. He had a field of fine large cane, but his boiling house and all its apparatus were of the ancient style of those

early days. Two or three seasons of hard work clearly demonstrated that the enterprise would never pay, and like many before him, his money and credit went "where the woodbine twineth."

The present Honolulu Sugar Company were very fortunate in securing the services of a man possessing the nerve and courage of James A. Low, to take hold of such a herculean task as proposed—to turn an arid desert into a land abounding with cane juice, molasses and sugar—a task which very few would at that time have undertaken, on any terms. The company's lands extend from near Moanalua to the bounds



IN THE CENTRIFUGAL ROOM.

of the Ewa and Oahu plantations, a stretch of some five or six miles, and from the seashore to the foot hills of the Koolau mountains. Though broken by ravines in many places, the plantation covers some six thousand acres of good cane land, which large area may yet be increased by improving some small tracts, not now available, and are classed as waste land. To those who have ridden over these lands many times in past decades, as the writer has, the change from the former waste condition to the present luxurious growth is marvelous. It shows what pluck, backed by ample means, can do. And such work deserves a goodly recompense. The main factor has been the artesian water, forced two or three

hundred feet from the lower levels to the upland ridges and slopes. Though it has been an expensive and very laborious undertaking, it is worth all it has cost.

The following particulars of this fine mill, taken from the Commercial Advertiser of a recent date, will prove of interest to mill men in other places:

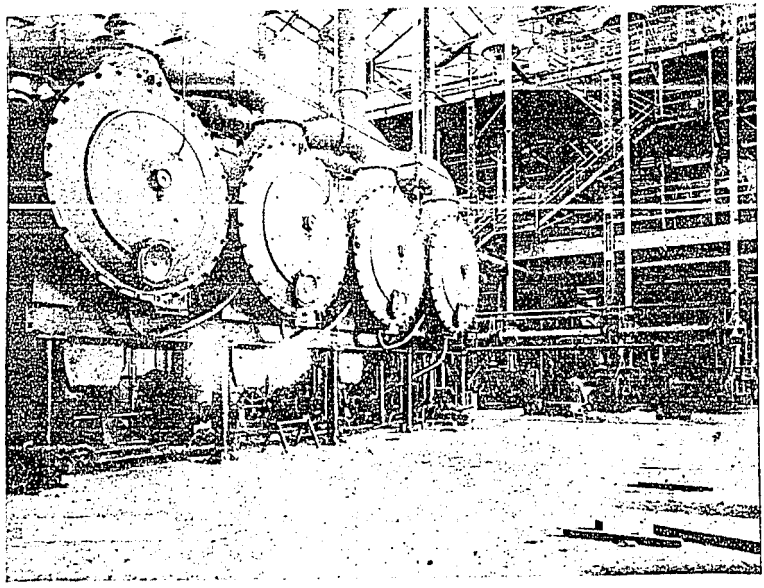
"The site of the new mill covers nearly three acres, and under the new process which has been introduced, the management hopes to reduce to the minimum the waste of the sugar, the latest inventions having been adopted throughout the vast system of machinery. From the time the cane is fed into the crusher until the sugar falls in grains from the crystalizers into the sacks, a thorough study of the process has been made and carried out with an eye to the best possible economy. A ten per cent waste in molasses will be avoided and it is expected that a percentage of ninety-two will be obtained in pure sugar. An improved system of centrifugals for the crystalization of the syrup has been instituted. There are twenty of them to receive the syrup from the clarifying pans, each having a velocity of from 1,200 to 1,400 revolutions per minute, the entire system being capable of taking off 200 tons of sugar per day. In the boiler house there are six 250 horse power Heine boilers, equipped with automatic fuel feeders, the trash from the crushed cane being utilized and entirely supplying the fuel for the running of the big system of machinery. In the boiling house, where the cane juice is boiled into sugar, there are three 7,000-gallon Kilby pans to receive the raw syrup, and also Lily evaporators. Under the old system open clarifiers were used in liming and boiling. The new machinery has a compressed air process and the syrup is continually stirred by an arrangement of automatic blades. A novel and much improved feature of the crystalizing plant is the method of supplying power. The numerous and dangerous belts are all done away with, and a neat substitution of clutches serves the purpose, leaving the passageway free from obstruction. The centrifugals are driven by water power derived from two Risdon high-duty pumping engines, the first of the type to be used in the Hawaiian Islands.

The crushing department has a 34x78 eleven-roller mill, all connected and driven by one engine, and the filtering process has been improved according to the latest up-to-date equipments.

Automatic conveyors and machines for drying the sugar before bagging facilitate the shipping of the sugar, and the truck railroad is being completed in the shipping room, to be ready for operation soon.

Steel has been used in the construction of the building throughout and the building as well as the machinery within it has been constructed entirely by the Risdon Iron Works. A self-supporting stack, 150 feet high from a 30-foot base, the invention of Gillot Hersog of Milwaukee, is the only stack without guy ropes on the Islands. It is brick-lined and is 13½ feet in diameter, being anchored with long bolts.

The installing of the new machinery has caused some delay,



IN THE BOILING HOUSE.

but the big structure and the mill within it have gone up with astonishing rapidity. The mill site covers 42,000 square feet and the machinery has been so arranged that the plant can be doubled in the same building area without displacing any of the present structures.

Mr. Low says there is an unusually good crop of cane, the stalks averaging twenty feet in height, and there being very little "lala" growth. He expects a yield of from 11 to 12 tons of sugar to the acre.

The sugar house is a four story building of ample dimensions to accommodate all the work under one roof. On enter-

ing, the visitor is struck with the admirable arrangement for each department of the service. New and ingenious devices —some of them original—reduce the labor, and consequently the number of workmen in the mill. The cane is of course brought to the mill in cars as usual, but the unloading is not done by hand nor by dumping, but by a mechanical apparatus, which dispenses with a gang of laborers, but supplies the cane regularly to the mill with hooks, very much after the style of loading grain with buckets at the elevator houses in the Western States. This ingenious operation is regulated by a man stationed overhead, who turns a wheel very similar to the steering apparatus on sea vessels. This is a simple labor-saving operation, that seems to work to perfection, supplying the mill that crushes the cane at the rate of 1,300 tons a day. Not a leather band or belt is seen throughout the building, and yet the whole machinery, including the 11-roller mill, moves as noiseless and smooth as clockwork, turning out from 150 to 200 tons of sugar daily. We might go into further details, and point out improvements here and there, introduced here, so far as we know, for the first time, but this we leave to those who are interested in details to examine for themselves, for it must be seen to be fully appreciated. The shareholders in this company have every reason to be satisfied with the success attending the first work of the new Honolulu Sugar Company, which is a credit to Hawaii, to the Manager, Mr. Jas. A. Low, and to all connected with the mill and estate. It moreover marks a new era in Hawaiian sugar factories. The present crop is estimated at 10,000 tons of sugar, the second at 20,000, and the third at 30,000. The mill and all the machinery have been supplied by the Risdon Iron Works of San Francisco, and are in every respect "up to date."

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INFERTILITY OF SOIL.

On almost every farm or plantation, soil spots exist where cane, grains and fruit trees do not thrive or bear fruits well. Dr. Phipson, an English authority who has for forty years made the study of soils in various tropical cane-growing countries, makes the following statement in the International Sugar Journal regarding the results of some of his study:

"I have recently been investigating the cause of infertility

in a Brazilian cane soil which produces very poor results. The problem has been satisfactorily solved, and the hidden cause of the failure of the crops clearly discovered. The soil is of a dark color and very moist; the sample as delivered yielded nearly a quarter of its weight of water in the shape of uncombined moisture. It contains a good admixture of clay, and though rather poor in phosphoric acid and lime, it yields a good amount of nitrogen, soluble silica, and alkalies; in short, though not a rich soil, like some of those in Demerara and Jamaica, it contains all the elements of fertility, and nevertheless gives very poor crops. The analysis shows about 10 per cent of organic matter, mostly of a peaty nature approaching to lignite; and it might, at first, be thought that this would prove advantageous as a source of carbonic acid. But when this organic matter was isolated and examined by itself, I found that on burning it left a reddish ash which indicated the presence of pyrites (marcasite); and when the soil was acted upon by nitric acid the solution obtained gave a very much larger amount of sulphates than is ever found in fertile soils. It thus became evident that the cause of infertility in this dark colored soil is the presence of radiated pyrites in the lignite which forms one of its ingredients; this, undergoing constant oxydation with formation of sulphate of iron, acts as a poison upon the delicate rootlets of the cane, and so interferes with successful cultivation."

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ENGLAND AND HER FREE SUGAR SYSTEM.

There seems to be a fair prospect that Parliament will impose a duty on sugar imported into England from countries that are not under her rule. At present the larger part of the sugar consumed in England is the product of European fields and factories, though some is obtained from her colonies and dependencies, at a very low price, which barely covers the cost of importation. Her numerous refineries, which for many years turned out the choicest sugars that have ever been marketed, have all been compelled to shut down, at great loss, leaving the refining business to be carried on and her people to be supplied by the European factories. Should a duty be imposed, it will probably result in the reopening of these factories, and possibly to the introduction of the sugar beet industry, as the experiments of the past

few years show that beets can be grown as profitably there as in Europe. Should this change of policy be adopted, as now seems quite likely, it will tend to revive the sugar industry in the various colonies of the British Empire, and will tend to depress for a time the beet industry of Europe, which is now encouraged by Government bounties.

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PLANTS SENT BY MAIL.

The Postmaster-General, at the request of the California State Board of Agriculture, has given instructions at Pacific ports of entry that all parcels of mail containing fruits or plants shall be inspected by the horticultural officials before delivery to the persons addressed. The above state board assert that a large number of pests are carried in the horticultural products from Hawaii and the Philippines. Secretary Wilson states that the quarantine service which California has been carrying on for some years to protect the State from injurious insects, especially from Asiatic and Australasian ports, has done admirable work and has saved the horticultural industries on the Coast from great loss. If the instructions to postmasters suggested can be issued, he says, the protection of the fruit growing interests of that part of the country will be complete. We feel quite certain that no parcels of plants go from Honolulu uninspected, as the officers in charge here are extremely vigilant in their duties, and do not hesitate to carry out all instructions given to them.

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THE HOLOCAUST OF HAWAIIAN POSTAGE STAMPS.

One result of the annexation of Hawaii to the United States has been the destruction by burning of all the Hawaiian postage stamps remaining in the possession of the Hawaiian and American governments. Those that were held here were burned a year or more ago, and recently those that had been sent to Washington some time since were destroyed, as stated in the accompanying telegram:

"Washington, February 26.—The Post Office Department has recently destroyed 54,000 postal cards of one and two-cent denominations, being the last remnant of the Hawaiian postal service. Previous to this, all the uncancelled Hawaiian post-

age stamps obtainable had also been burned. Their face value was about $58,000, but if the department had had the power to sell them, at least $150,000 would have been given for them by enterprising collectors."

It may be of interest to note here that the first postage stamps ever issued by the Hawaiian Government were printed and issued by the present editor of the Planters' Monthly, who was, at that time (1850), manager of the government printing department and postmaster for Honolulu. Special care was taken to procure paper that was not in common use, and this was found in the store of John Hackfeld, brother of the well-known founder of the firm of Hackfeld & Co., of this city. It was a thin German or French paper, known as "Overland letter paper." Stamps of three denominations were first issued—2, 5 and 13 cents, the latter included American postage 6c and sea postage 2c. An edition of the 13 cts. stamps, engraved on copper plate in Boston, was also obtained. If our memory serves us rightly, there was only one edition of 10,000 of these stamps ever issued from those plates, their use having been superceded by change in the rate of postage. This edition was printed on thick white paper, of a yellowish tint, and specimens of the original issue are very rare.

All Hawaiian stamps have now passed out of use, and the few cancelled and uncancelled that remain in private hands will be prized as mementoes of a mid-ocean postal service that always kept in the front rank, as compared with wealthier and older nations, and has been considered an honor to Hawaii and to all connected with her service. It has also been one of the most potent factors in educating native Hawaiians to the use of epistolary correspondence, in which they, greatly to their credit, are so noted. Nothing pleases them more than the ability to talk to their friends living hundreds of miles away, and receiving responses from them.

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THE LABOR QUESTION IN QUEENSLAND.

The success of the sugar industry in Queensland depends in a large measure on the importation of foreign laborers either from China or the South Sea islands. Under the new conditions the importation of contract laborers is forbidden, which may prove a disastrous blow to the sugar industry

there. Mr. Barton, the premier of the new Australian Republic, in his opening address said: "I have reserved to this stage one of the most important parts of my speech. It is under the heading of a white Australia. (Applause.) Legislation against any influx of Asiatic labor we shall regard simply as a matter of course. Not so Polynesian or Kanaka labor. If we were at the beginning of it now, we should have quite a strong objection to that, but we shall not be guilty of any oppression of those Kanakas already in Australia. But we shall take care to restrict the importation of more of them. We shall try to prevent any such importation as will increase the number of Kanakas in Australia under any circumstances, and we shall preach and ensure a gradual abolition of the importation. This legislation will be introduced without delay."

A writer, commenting on the Chinese exclusion policy says: "The main, and in the opinion of the Government, the insuperable, objection to allowing the immigration of Chinese is the fact that they cannot be admitted to an equal share in the political and social institutions of the colony. The form of civilization existing in the Chinese Empire, although of a complicated and in many respects marvellous character, is essentially different from the European civilization which at present prevails in Australia. Under our system every citizen is allowed to have a voice in the government of his country, and the presence in any considerable numbers of an alien race occupying an inferior position could not fail before long to bring about very serious troubles, and would probably necessitate a radical change in our political institutions, and entirely alter the future history and development of Australia. There can be no doubt that the public opinion of Australia is firmly and resolutely opposed to the further introduction of Chinese, and it has become a matter of pressing moment to devise the best and most efficacious means, acting within the rules of international comity, of excluding them."

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RATIONAL MANURING ON HAWAIIAN SUGAR PLANTATIONS, FROM A PRACTICAL STANDPOINT.

Much has already been written about the fertilization of Hawaiian soils and expert chemists and scientists have spared neither labor nor expense in the pursuance of their investiga-

tions, of which their exhaustive and instructive reports give evidence. Any attempt, on the part of the writer, to corroborate or supplement their work, would therefore seem absurd, if is was not for the fact that these reports often lack in one point, that is simplicity, and consequently they have not become as popular as they really deserve. Our sugar planters are mostly practical men and such they must be; large volumes abounding in theories, technical and chemical terms and phrases are of little or no use to them. They want something plainer, for they have not the time to study them thoroughly after a full day's toil. The writer will endeavor, in as few words as possible, to treat of the most important facts connected with the fertilization of Hawaiian soils, in order to present as clear a view of the matter as possible.

The fertility of a soil depends greatly upon its relative contents in plant food, but its chemical composition, mechanical condition as also the local climatic and geological conditions are also of great importance.

The actual percentage of the plant food in a soil is easily determined by a chemical analysis, and it seems to be the prevailing impression that this is the only safe and reliable way; but the following reasons will show how wrong this is. In the first place the greater part of the plant food in a soil is mostly present in a quite insoluble and inert form, hence not immediately available for the plant. Furthermore, the manner in which soils are produced, renders it impossible that any considerable area shall be of uniform composition. Even if we could, by any means, obtain a sample which would represent the average composition of the soil, we are met with the further obstacle that no method of analysis, yet devised, is able to give us much information as to the actual availability of the material for plant food. Too much, therefore, must not be expected of a soil analysis, for we cannot reproduce, in the laboratory, the action of the natural agents upon the soil. Of late several methods have been brought into prominence, but as scientists greatly differ upon their respective merits, this question has as yet not been definitely settled. Dr. Maxwell has used a 1 per cent solution of aspartic acid as his normal standard, whereas Dr. Wayner, the eminent German authority, has based his experiments upon a 2 per cent solution of citric acid. The acids used by both

are weak organic acids and no doubt are very much similar to the acid secreted by the roots of plants. Numerous obstacles, however, are met with in the practical application of these methods and it is hardly possible that all can eventually be overcome. For instance, soils always contain more or less carbonate of lime, and before the acid applied will act upon the soil, a good deal of it combines with the lime and is thereby neutralized. Since soils are exceedingly variable in their contents of lime, it is only natural that the results of these methods are often misleading.

Again we know that sugar cane generally responds to an application of about 1,000 pounds of concentrated chemical fertilizer to the acre; in fact this will often have a highly stimulating effect upon a growing crop. If now a sample is taken of the soil before and after manuring and analized, it will be found that there is no noticeable difference in the two analyses. It is quite clear that 1,000 pounds of fertilizer mixed with an acre of soil to the depth of about one foot, (or 9,091,422 cubic feet) can hardly be traced by chemical analysis, for it is practically impossible to analize a soil beyond a certain degree of precision. As a matter of fact, therefore, it is obvious that practical experiments are far more reliable, in determining the actual fertility of a soil, than the chemical analysis. The latter is, however, exceedingly valuable in cases of an abnormal condition of soils and the presence of substances injurious to plant life.

In connection with the rational manuring of our soils, we have to consider the following points:

What are the special requirements of a crop of cane?

How far do our soils meet these requirements?

What have we to offer our soils in order to conserve their fertility?

A crop of 35 tons of cane takes approximately the following amount of vital plant food from the soil:

	Nitrogen. lbs.	Phospt. Acid. lbs.	Potash. lbs.	Lime lbs.
35 tons of cane ready for grinding	41	40	85	17
2 tons 8½ cwt. of tops and green leaves	9	5	33	5
4 tons 4½ cwt. of dry leaves	23	8	53	50
Or a total of	73	53	171	72

Most of the tops and leaves, however, remain on the land and are afterwards burned. The phosphoric acid, potash and lime in these is therefore restored to the soil, whereas the nitrogen escapes into the air during the process of burning. The quantity of the various ingredients actually removed from the soil in harvesting 35 tons of cane is therefore 73 pounds of nitrogen, 40 pounds of phosphoric acid, 85 pounds of potash and 17 pounds of lime. Now then, if a soil shall not become exhausted and utterly depleted of its fertility in the course of time, it is necessary to restore to it all, or at least the greater part of the vital elements of plant food removed by cropping. But, before deciding upon the proper kind and composition of the fertilizer to be used, it is exceedingly valuable to study the particular nature of the soil, its physical properties, the climate, etc., etc.

Fortunately most of our soils readily absorb and retain all soluble fertilizers, with perhaps the exception of nitrate of soda. The latter must therefore be given sparingly at any one time, to save the planter from loss. Nitrogen in other soluble forms as also soluble phosphatic and potash manures may be applied with perfect safety on the average Hawaiian soils. Light, sandy and very porous soils, are seldom met with on our plantations; these require special attention and treatment, suited to each particular case. A few practical experiments will soon afford us a sufficient amount of information for our guidance in the proper treatment of these.

As a matter of fact the manuring of our cane fields is a very simple matter. Its main object, of course, is to keep up the fertility of the soil, and this is best done by applying such plant food in sufficient quantities as is taken away by cropping. It will pay the planters to use only the best and highest grade fertilizers obtainable, which are sold under a full guarantee of their contents of plant food. They will know exactly what they are buying and can apply the proper composition in quantities to suit their purpose. After experimenting with different fertilizers for years, a good many of our planters are now using a certain composition for all their fields and do better with it, than with special preparations for each different field.

Undoubtedly all fertilizers, containing the necessary plant food in a highly soluble form, are the most effective and ben-

eficial ones, for they assist the soil in presenting to the plant a portion of the food, necessary for its growth, from the beginning. The composition of the fertilizer should correspond with the requirements of the crop, though it is advisable, for reasons following, to give a proportionately heavy dose of phosphoric acid. The bulk of all Hawaiian clay soils is made up of the oxydes of iron and alumina. Both of these compounds eagerly absorb and, later on, combine with phosphoric acid, and hold the same tenaciously, forming an insoluble combination. This, no doubt, will also happen with the soluble phosphoric acid, which is applied to the soil; but some time is required for this process, and before it has taken place, the plant roots have had sufficient opportunity to avail themselves of the supply offered them. Nitrogen and potash are not effected in this way, by these oxydes, and are therefore easier available for the plant than the phosphoric acid. As the amount of lime actually required by the sugar cane for food is not considerable, it is hardly necessary to apply it to the soil for this purpose, unless the mechanical condition of the soil or other reasons make it desirable; for most of the artificial fertilizers used on these islands already contain enough lime in the form of gypsum.

It has been the aim of the writer in the preceding notes to offer a few plain and general suggestions to our planters regarding the practical manuring of Hawaiian cane fields in general, and it is sincerely hoped that his prediction will be supported by such evidence as can only be derived from actual practical experiments. H.

Honolulu, March 25, 1901.

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FORESTS AND RAINFALL.

Mr. Editor:—Recent articles in the Planters' Monthly on the subject of forests must leave the reader in doubt about the facts and the conclusions to be drawn therefrom.

It appears to be a frequent error to mistake cause for effect. Vegetation is said to be the cause of rainfall, when it is the effect. The well known fact that generally on these Islands there is a heavy rainfall in the upper forest region while on the bare plains below the rainfall is small does not prove that the forest is the cause of rain. Generally forests will not grow with less than thirty inches of annual rainfall.

Forests, especially those with dense undergrowth, sustain springs. They retard the flow of water to the streams, and delay the melting of snow and ice. The flow of streams is therefore equalized. Sudden freshets are less frequent and periods of low water are shorter. As there is practically the same amount of evaporation from a forest area as from cultivated or bare areas, the total run-off is the same in all cases.

In a forest water is more readily absorbed, and the absorption is longer continued because the surface run-off is retarded.

The water supply of Oahu is obtained mostly from springs and wells. The source of the water is in the large forested mountainous area in the middle of the island. Continued rains on this area cause little surface run-off. The stream beds seldom carry much water except from lower springs that flow from the same general source.

It is therefore of vital importance that this forest be preserved. This can readily be done, and is already being done. In no other way can this bountiful water supply be stored for the needed irrigation.

In Maui and Kauai the conditions are similar to Oahu.

On the Island of Hawaii crops are generally not dependent on any forested area. Forests have remained and they should remain until a better use can be made of the land. Such better use in Hamakua and North Hilo has been well stated in the report of one of the members of the Committee on Forestry.

The rainfall on the forest area of Olaa can practically be utilized only on that area. There is no spring nor stream of any size. Should deforestation reduce the rainfall, that would be something of an improvement. There is no possibility of this area becoming less useful by its deforestation.

In Europe, notwithstanding deforestation, fertility has increased. While this is owing to better farming, there has been practically no decrease in the rainfall to prevent the increase of productiveness.

The sea and the topographical features of a country have much more effect on rainfall as caused by changes of temperature than the vegetation.

The rain-producing effect of the mountains of Oahu which has been much observed at the head of Nuuanu Valley is far greater than the effect of a forest. Neither the presence of

forests nor their absence causes the difference of rainfall between Upper Nuuanu and Ewa Plantation.

One writer thus refers to the Sacramento River: "Ships of moderate draft had no difficulty to ascend as far as Marysville," and that the destruction of forests "is entirely responsible for the river's low water mark in summer time."

The fact is that formerly the Sacramento was a deep tidal river. During the dry months of autumn at least, the water surface was practically at sea level, and without any tributary whatever there would still have been a deep, navigable channel. In later years the greater part of the channel was filled with debris, mostly from the hydraulic mines.

A recent state report on forests, basing its conclusions on records beginning in 1825, says: "And we are forced to the conclusion that it is impossible to trace any effect, either upon rainfall or temperature due to the distribution of the forests." "The result of these studies must be regarded as demonstrating that the records of rainfall and temperature fail to show any difference in climate between forested and deforested portions of the State, which may with confidence be ascribed to the influence of the forests."

C. H. KLUEGEL.

Hawaii, March, 1901.

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SUGAR AS FOOD.

A recent number of the United States Consular Reports publishes an article on this subject, in which it is stated that German scientists have investigated the question as to whether the amount of sugar used by individuals can be increased without hesitation, as sugar has many valuable characteristics. Its value lies not alone in its sweetness, but in the fact that it is a valuable dietetic remedy and an excellent article of food. Sugar is a very easily soluble carbon hydrate and as such is quickly assimilated in human and animal bodies, producing warmth and force. It is also fattening, while as a developer of strength, it has long been used, especially by mountain-climbers. Various experiments have been made for the purpose of ascertaining whether sugar can be advantageously used for fattening animals. The results have proved favorable as far as hogs are concerned. It has been found that by-products of sugar fabrication, denaturalized and free

of tax, can be advantageously used as food for hogs. Molasses, which contains about 50 per cent of sugar, is already much used, mixed with palm flour or peat, as cattle food.

The principal object of the experiments has, however, been to ascertain positively whether, as alleged, sugar possesses the power of quickly increasing or restoring strength and thereby making men fit for unusual exertion. This point has been carefully investigated, the scientist not watching the entire muscular action of a man, because that would have been too difficult, but confining himself to observing a single finger through an instrument called an ergograph—i. e., "work measurer." He allowed the middle finger of the right hand to lift a weight, and then registered the degree of the lifting force. The experimenter found that after sugar had been eaten the lifting force was stronger than before, and he therefore concluded that sugar is a strength-producing material.

Other investigators claim, however, that sugar has merely an exciting effect through its sweet taste, and that a dulcine solution, which contains no carbon hydrate and accordingly can not be nourishing, has the same effect as sugar water. The inference from this is that the assertion that sugar produces strength is a fallacy.

This disappointing experiment has, however, been repeated by two scientists, and the same result was reached when the man experimented upon had his full strength; but the effect of eating sugar was found to be entirely different when the man had first tired himself by turning a heavy wheel (ergostat). The eating of sugar brought to the exhausted man new strength, and the ergograph registered increased force, which was not the case when dulcine was eaten. It is accordingly accepted in Germany as satisfactorily proven that sugar can renew the strength of a wearied man through giving his tired muscles carbon hydrate as a strengthening material. Extensive experiments have since 1898 been made upon German soldiers at the maneuvers, with moderate success. It is believed that by eating half a dozen cubes of sugar more than usual in a day, a soldier's power of endurance is increased. The Germans at any rate think it worth while to continue to experiment, for the purpose of ascertaining positively whether sugar can give renewed strength to exhausted troops, thereby increasing their value in moments of emergency.

ARSENICATED SUGAR.

(British Produce Markets' Review.)

Considerable excitement and alarm have been caused in Manchester, Liverpool, Birmingham, and other towns by the prevalence of a malady which seems to have puzzled the doctors until one of them was struck with the similarity of the symptoms to those of slow arsenical poisoning. The wide range of the disease and the large number of its victims made it necessary to look for the poisonous material in some article of very general consumption. Beer very quickly fell under suspicion, and we are now informed that in certain samples tested for arsenic that substance has been found in mischievous quantity. The statements on that point are a little less precise than might be desired, still they render it at least probable that some, if not all of the beer retailed to the public in these towns is contaminated with arsenic. An authority on tropical diseases has pronounced the symptoms of some patients at Chester to be such as would be assigned to Beriberi in a tropical country. But as there is no evidence of the importation of that disease, which depends upon a specific parasite, it does not seem probable that the explanation is to be found in that direction. There is no difficulty in seeing how arsenic might make its way into beer. Indeed, the thing is so simple that the difficulty is to understand why, if beer is the source of the mischief, poison symptoms did not force themselves upon medical attention years ago. Most people are probably dimly aware that modern beer is made from a great many substances besides the malt and hops from which it was exclusively derived in more primitive ages. The alcohol produced by fermentation comes in all cases from the decomposition of sugar, but the origin of the sugar is immaterial so far as the alcohol is concerned, though it exercises an important influence upon flavor. Old-fashioned people still think that the sugar contained in malted barley is the only proper sugar for brewing purposes; but other sugars are cheaper, and public taste has been educated to accept beers which would have been rejected by our forefathers in days before the introduction of tea.

The sugar now largely used in brewing comes either from low grades of cane sugar or from some cheap form of starch, most commonly the starch of Indian corn. In both cases the conversion into brewing sugar is effected by treatment with

sulphuric acid. Now commercial sulphuric acid is largely made from iron pyrites which yield sulphur on roasting. But they also contain arsenic, and arsenic is volatile at the temperature employed. Consequently arsenic passes over with the sulphurous vapors which are led into the acid chambers, and finally appears, sometimes in very considerable quantity, as an impurity in the resulting sulphuric acid. We have only to suppose that the maker of brewing sugar uses this arsenical sulphuric acid to convert his maize starch, in order to understand how arsenic in appreciable quantity may find its way into beer. Arsenic may be said to be invariably present in commercial sulphuric acid, but it is naturally present in far larger quantity in some samples than in others. For many of the numerous purposes for which sulphuric acid is used the presence of this impurity does not matter. But when the acid enters at any stage into the preparation of things eventually eaten or drunk, the presence of arsenic matters a great deal. It might be thought that so elementary a proposition would always be present to the minds of those who manufacture articles of food or drink. But in this country of amateur manufactures of all kinds are carried on by mere rule of thumb; and it is very probable that thousands of tons of brewing sugar have been made by a cut-and-dried formula under the direction of foremen who never troubled themselves to inquire where sulphuric acid comes from or what it may contain. It is open to anybody in this country to start any business he pleases, no matter how far public interests may be involved in its intelligent and conscientious direction, with no other equipment than knowledge of one or two good old trade recipes. To such a man sulphuric acid is just sulphuric acid to be bought as cheaply as possible. It remains to be seen that breweries have been supplying arsenicated beer. There is no excuse for them if they have been using arsenicated sugar without knowing it. They ought to ascertain for themselves the purity of the ingredients they use, and, if they have no chemist on the premises capable of conducting the exceedingly simple and conclusive tests for arsenic, their negligence is culpable.

Mr. H. A. Hobson, who has had twenty years' experience as an analytical and technical chemist to a very large firm of Burton brewers, states that it pays the beer manufacturer to use glucose, because it saves him malt, which is much more expensive, giving a gain of 4s to 6s per barrel. If the brewer

employs glucose it should be good, because it can be obtained quite easily without arsenic, for there is plenty of it supplied to confectioners perfectly free from poison. In the process of boiling maize, starch, or very common cane sugar with sulphuric acid, the acid is neutralized with chalk, which forms a white precipitate of sulphate of lime, and that is strained off, but some of the arsenic remains in the glucose solution. The arsenic comes originally from iron pyrites, which are burned. It is quite possible to get pure sulphuric acid without arsenic. He, upon analysis, has found arsenic in glucose in quantities that would have led him to refrain from using it for brewing. The operations of the Foods and Drugs Act should extend to the analysis of glucose and brewing sugars. He maintains that it is not necessary to use glucose or sugar, except for cheapness, and, if pure beer is required, brewers must go back to malt and hops, to which, indeed, some brewers confine themselves.

It is said that instead of purchasing the pure acid a firm of glucose manufacturers bought only the "ordinary commercial," with the result that a considerable residuum of arsenic was contained in all the products made out of that particular purchase.

There are only about a dozen manufacturers of glucose in England, a considerable proportion of the stuff being imported from America. Most of the manufacturers sell to brewers, tanners, jam makers, nd syrup factories, but the particular firm under suspicion is said to have sold only to breweries, and within a limited territory.

When attention was first called to the presence of arsenic in certain brands of cheap beer it was discovered that in every instance glucose or invert sugar had been used in the breweries. As this opened up the possibility of even more widespread poisoning, samples of jams and golden syrup were obtained for chemical analysis, but in none of these was found the least evidence of arsenic. By the process of exclusion it therefore became apparent that those manufacturers of glucose who supplied brewers and jam makers simultaneously must have used the pure sulphuric acid.

This narrowed down the injuiry to the remaining few makers whose custom lay among brewers exclusively. Further samples of their product were subjected to tests, with the result that in one instance arsenic was discovered in a ratio that was absolutely deadly.

"This is a matter which only a judge and jury can decide," said one well acquainted with the brewing trade. "If the chemists sold 'ordinary commercial sulphuric acid' as 'pure,' then it will devolve upon them to make explanations; but if the glucose manufacturers bought 'ordinary commercial sulphuric acid' and used it in the manufacture of glucose or other food product, then it is a still more serious matter. For my part I should not like to be in the position of either of them."

Meantime the epidemic has developed into a scare in and around Manchester. Every case of illness a little out of the ordinary is at once put down to arsenic poisoning. At every hospital yesterday fresh cases were treated, but none were serious enough to warrant detention. The prompt measures taken by the city authorities may be said to have stemmed the spread of the complaint, the new cases being mostly the result of fright or "overnight indulgence" rather than poison.

One firm of brewers whose beer was found to be tainted took herioc measures to prevent further mishaps. Every barrel of beer in the cellars of their customers was at once placed under an embargo, and publicans were warned not to sell a drop of the beer until it had been certified pure by analysts deputed by the brewers to visit their customers. Particular brews in which the poisoned glucose had been used were recalled wholesale, the loss to the firm amounting to several thousands of pounds.

The Manchester coroner has also issued a general warning to beer sellers, pointing out the risks they run in selling beer which has not been examined and certified to be pure; but perhaps the only pleasant feature of the scare—to temperance advocates at least—is the fact that the consumption of fourpenny ale in the cheap public houses is not a fraction of what it was a month ago.

Arsenic as a temperance argument has proved irresistible.

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WEST INDIA COMMITTEE.

The circular of the West Indian Sugar Committee contains the following:

FRANCE AND THE BOUNTIES.—While no date has yet been fixed for the re-assembling of the Brussels Conference, it is worth noting that the sugar question came up in the Chamber of Deputies in Paris recently, when a Deputy from the wine districts, in defending a branch of the wine industry against

an accusation of enjoying undue privileges, showed what an enormous sum the beet-root sugar industry was receiving from the tax-payers of France. He gave the figures, which were only completed up to the end of last July, viz:

1899—1900.

Sugar Production	869,200 tons.
Quantity which enjoyed Reduction of Duty	249,644 tons.
Ditto of Colonial Sugar	25,715 tons.
Total indirect Bounty to home and Colonial Sugar Industry	82,607,958 frcs.
Direct Bounties	18,769,341 frcs.
Total Bounties	101,377,299 frcs.
Consumption, 1899	447,614 tons.
Exportation	370,357 tons.
Duty levied	201,089,034 frcs.

This shows, as was pointed out in the debate at the Society of Political Economy in Paris on December 5th, that it will not be long before the whole revenue from sugar is absorbed in paying bounties.

Many French economists continue to urge the advisability of lowering the tax on consumption which they think would give an important stimulus to consumption. M. Georges Dureau, in the current number of the Journal des Fabricants de Sucre, also holds this opinion, and points out that when, in 1880, the tax was reduced from 70 fcs. to 40 fcs. consumption went up in two years from 280,000 to 400,000. He adds that it is not too much to admit that if the present tax were reduced from 60 fcs. to 30 fcs., it would not require three years for the consumption of France to reach 700,000 tons. As far as the French Government are concerned, their main object in dealing with the sugar question will be the revenue. This being so, the following figures, which have just been published, giving the product of the sugar duty for the year 1900 as compared with 1899, are worth reporting:

	1900 Fr.	1899 Fr.
Colonial	22,037,000	30,425,000
Foreign	149,000	353,000
Home grown	152,009,000	159,043,000
Total Francs	174,195,000	189,821,000

The reduction in 1900 being 15,626,000 francs.

THE RECIPROCITY TREATIES.—It is stated, upon what appears to be good authority, that President McKinley has forwarded to the Senate a number of Treaties with Great Britain,

extending for a year the period allowed for the ratification of the Reciprocity Conventions with certain of the British West India Islands and British Guiana which failed to be ratified by the Senate last session. We have already pointed out that there was nothing in the conventions, as previously agreed to, to prevent the United States according similar advantages to those afforded by the proposed treaties, to other sugar exporting countries, and we now learn that it is proposed at Washington to enter into similar treaties with Nicaragua, Ecuador, the Dominican Republic, and St. Croix. Inasmuch as Trinidad is not now included amongst the countries with which treaties are being made, it would seem that her sugar will virtually be penalized in the future to the extent of £1 a ton, as compared with that of most of the western sugar-producing countries.

Cane Trashing.—A prize was recently offered, in connection with the Cairns Annual Show, by the Colonial Sugar Refining Company of Queensland, for the best set of answers to ten questions on sugar cane cultivation. The successful competitor was Mr. Thomas Binnie, cane farmer, of Hambledon, whose replies were published in The Queensland Agricultural Journal for November last. Many of the questions were of local interest only, but the reply to one—"State your opinion for and against top and bottom trashing,"—merits the careful attention of planters in the West Indies. We accordingly append it in extenso: "In my opinion it is of the greatest advantage to the farmer to trash his cane when it has grown to the length of from two to three feet, as by so doing you let air and light into the cane, both of which are conducive to growth, you allow the young suckers to come away and make cane, and prevent water in the wet season from lodging around the cane inside the leaves, causing it either to throw out rootlets from the joints or to shoot from the eyes. This trashing also leaves a protection on the ground for the cane when it falls over, and by keeping it off the damp ground prevents it from rooting where it touches the soil; it cheapens the top trashing required just before harvesting, and prevents loss by breaking, and finally assists and cheapens cutting, as if done properly, and the trash cleared well away from the stools, the cutter gets a clean blow at the roots of the cane, and does away with the evil of cutting high, and leaves him no excuse for not cutting below the ground. The great ad-

vantages of a top trashing or stripping, if done about a fortnight before harvesting, are that it enables the cane by exposure to the air to ripen up, it allows the cutter to top off the stick close to the green top, and enables the farmer to give satisfaction at the mill by not sending green unripened cane. This year I have tried an experiment in two trashings as against one. In one field I trashed early in April at a cost of 7s. per acre. I left one acre untrashed. This week I have stripped the field at a cost of 6s. 6d. per acre, and put two boys on to the acre untrashed. It has taken them four days to do the work, which at 6s. per day means 24s. per acre for one trashing as against 13s. 6d. for the two."

Seedling Canes.—We have received from Mr. Chamberlain copies of two letters from Dr. Morris on this subject and two pamphlets summarizing the results of the sugar cane experiments carried on during the past year in Barbados and the Leeward Islands respectively. In connction with the latter it must be borne in mind that comparison is now being made in Barbados between the new B 147 cane and the Bourbon in its decadent days, decrepit from disease, and not with the Bourbon in the heyday of its vigorous growth, when its yielding powers are fully equal to those of the new variety. Recent private advices seem to be all agreed that the seedling canes resist disease better than the old Bourbon cane. The experience of some planters in respect to the B 147 is that it does not ratoon well, which would, of course, practically make it an unsuitable cane generally. We have suggested to Dr. Morris that there might with advantage be added to his list of chief points for consideration in selecting a variety of cane for cultivation on a large scale: "How does it stand drought or excessive rain?" "Does it ratoon well?" the latter being a most important consideration.

Imitation Demerara Sugar.—An important case under the Food and Drugs Act was heard at Tredegar Police Court on Tuesday, January 15th, 1901, before Messrs. E. J. Williams in the chair, J. Stanfield and A. Barrett, in which Mr. Morgan, grocer, was summoned by the Monmouth County Council for selling Demerara Sugar not of the nature, substance, and quality demanded, to the prejudice of the purchaser; in other words, sugar dyed with aniline dye to represent genuine Demerara Sugar. Professor Harrison, F.C.S., F.I.C., the Gov-

ernment Analyst of British Guiana, and Dr. M. Teed, B.L., attended at the request of the West India Committee, for the purpose of supplying the Court with information as to the nature of genuine Demerara Sugar, and they were furnished with certificates from 54 Sugar Estates in British Guiana and 15 Sugar Factories in Trinidad, which were received by the last mail, to the effect that no aniline dyes were used in the manufacture of Demerara Sugar, and it is largely due to their evidence that an exemplary fine of £10 with £15 costs was inflicted on the defendant.

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WIRELESS TELEGRAPHY BETWEEN BELGIUM AND ENGLAND.

There has been recently established at La Panne, Belgium, a station for the exchange of wireless telegraphic messages between Belgium and England. The receiving apparatus to be used on the English coast was taken across a few days ago from Ostende on board the Dover-Ostende mail boat Princess Clementine, which is also fitted up with temporary apparatus to be used in the experimental trials. La Panne has been selected on account of its being the point on the Belgian littoral nearest the English coast. The mast of the Marconi station at La Panne is 130 feet high. To the foremast of the steamship Princess Clementine is affixed an additional mast, which increases its original height about 60 feet. From this extremity, the telegraphic waves will be projected toward each coast. A special room has been fitted up on board the steamer for the instruments, and from this room the cable will be carried to the top of the extended mast. It is confidently expected to obtain communication between ship and shore for at least 30 miles, which is about halfway across. With stations at La Panne and Dover, those on board the vessel would be able to keep in touch with the land during the entire crossing.

On November 3, experiments began about 5 p. m. Telegrams were exchanged between the boat, then moored at the Ostende wharf, and the station at La Panne. Later in the evening, several of the Marconi men went on board the vessel and communicated with the land station throughout the crossing, except when they arrived in English waters. Communication was then discontinued, as the Belgium Govern-

ment has not yet received from the English Government authority to telegraph from Dover by this new system. This week—probably Wednesday or Friday—the official trial under the supervision of the Government delegates will be made.

The experiments showed that replies arrived with the same regularity and celerity as ordinary telegrams. When about 40 miles from Ostende, the captain of the vessel was able to telegraph to the stationmaster at Ostende the probable hour of his arrival. Various telegrams were sent from the vessel to Ostende, Brussels, Dover, London, and to the officers of the chief bureau and branch offices of the Marconi Company. The reception of each message was acknowledged promptly, the first and last letters being given in each instance.—U. S. Consular Reports.

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THE SUGAR CANE BORER.

Recent investigations in connection with the sugar cane borer have developed many important facts as to the life-history and habits of this pest. In Louisiana the vulnerable period in the development of the borer is during the winter months, and any method which will lessen the number of wintering larvae (borers), will reduce proportionately the attack on the crops of the following seasons. As the insect passes the winter in the larval or borer stage some food is necessary to sustain life in this condition. It has been found that this food is supplied in the following ways:

1. By the presence of shoots from the suckers of early cut cane. That is, the stubble of cane cut for the mill in October and early in November produces shoots of sufficient size for the late laying moths to deposit eggs upon; the stalks and leaves giving ample food for the developing borers. In case of a freeze the borer works down the stall to the sucker, and there passes the winter well protected by an inch or more of soil.

Sometimes the suckers of plant cane grow to sufficient size to attract late flying moths, and thus, like the stubble suckers, harbor borers during the winter.

2. In the cane trash before and after burning. The present method of burning does not by any means destroy all the borers. The eggs, and smaller specimens of larvae feeding upon the leaves are destroyed, but those that have burrowed

well into the stalks are seldom injured by the fire. In fact the burning preserves the cane rather than destroys it.

3. In succession cane, spring plant, many pieces of cane and tops are left in the field, and when exposed, or only partially covered, offer a suitable medium for this pest to pass the winter.

4. The seed cane areas, after spring planting, where it is particularly difficult to get rid of the trash by burning, many borers are left in the tops and pieces of cane distributed over the field.

5. In seed cane. It has been found that most of the large borers put down in the seed cane die during the winter, and that those which appear in cane at the time of spring planting are from eggs or very young borers that were upon the leaves at the time the cane was cut. Fall planted cane examined in February has been found to contain no borers, though many were put down with the cane at the time of planting. The fact that borers are wintered over in seed cane and not in fall planted cane is explained by the practice of removing tops of plant cane, which destroys the eggs and young borers upon the leaves.

6. In cane tops along ditch rows. It has been found that where tops and pieces of canes have not been carefully pulled in to the middle of the row next to the ditch, that the land side of the plow pushes upon the grass bank much of this trash which is not afterwards reached, and that in this trash the borer lives.

Remedial Suggestions.—In view of the fact that during a warm fall, where cane is cut early for the mill (15th of October to 15th of November), a great many shoots appear from ratoons, it is suggested that these shoots or suckers be cut down, and that this cutting be done as early as possible, and before any cold weather sets in.

Another plan suggested is to burn off all the trash of such cuts as soon as possible after the cane is cut for the mill, even though the burning be not very good, wrap the middles with two furrows, as is usual, and then run a cultivator or plow on top of the cane bed so as to cover the ratoons with a good coating of dirt, and thus retard sprouting. Sprouting in fall plant may also be checked by a heavier cover of dirt.

In shaving ratoons most of the shoots and many of the suckers are thrown into the bar furrows, and if left there

until warm weather sets in it is possible that the borers (in these shoots and suckers) may reach the moth (butterfly) condition, and thus become a source of infection for the new crop. To avoid this, deeply rebar as soon after shaving as possible, cover all the sprouts and suckers and allow them to remain buried just as late as is feasible with good culture.

In succession spring plant, and seed cane land, it is well known that a certain quantity of seed cane is left in the fields, sufficient sometimes for persons to glean such for planting purposes. As this cane and its tops are much infested this year with borers, it is recommended that all this waste be picked up, hauled off in a cart and destroyed, or dumped in the river. It is further suggested that all cane thrown out of succession spring plant middles be also picked up and destroyed, and, in fact, that all the fields, roads, and headlands be cleaned of any tops or pieces of cane, paying particular attention to that pushed out upon the ditch banks.

The present method of handling cane tops is not a satisfactory one in years when the attack of the borer is severe, and while little can be done this year it may not be out of place to make recommendations for next year's operations. The plan suggested for keeping down fall shoots in ratoons may be made to assist in handling the cane trash. All trash should be fired as early as possible and that not destroyed by the burning should be raked to the middles and deeply buried, to insure decay and the destruction of all borer food.

SUMMARY.—Sources of Infection. 1. Shoots from ratoons from early cut cane. 2. Shoots from fall plant cane, especially when lightly covered. 3. The pieces of cane and cane tops in succession spring plant, and in seed cane lands. 4. Seed cane. 5. In cane trash not buried, and in that partially burned when not buried. 6. All exposed pieces of cane distributed over the plantation, such as that dropped upon turn rows, ditch banks, and roads.

Remedies. 1. Retard all fall growth. 2. Burn and bury all trash. 3. Pick up and destroy all pieces of cane, and cane tops. 4. Carefully clean all succession spring plant, and seed cane areas.—Louisiana Planter.

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News comes in from the sugar districts, that the cane crop of 1901 is the most promising we have had for several years. While the winter and spring have been cool, or even cold, there have been no flooding rains and no severe freezes. The result is that the stubble cane crop is sound and coming up rapidly. The fall plant cane crop is generally reported excellent.—Lou. Planter.

WHAT'S A MULE FIT FOR?

The question is so often asked by farmers who have never used mules on their farms, preferring horses, that we shall give a few of the merits possessed by our long-eared friend.

The mule is an easy animal to raise.

He doesn't eat much as compared with a horse.

An energetic mule will make a trip quicker than a horse, though he may not go fast—the secret of his speed is his uniform gait, steady and persistent.

You hardly ever see a sick mule; he seems practically immune from the diseases which attack horses.

A mule can endure more hardship than a horse, will pull more in proportion to his size, and will "stay with it" longer.

A mule is easier "broken," or trained to work than a horse, and is more reliable after initiated.

If a team of mules runs away they look out for themselves, and though they may make some close turns and go through a needle's eye, so to speak, they usually come out unharmed.

We would rather plow corn with a team of mules than with horses; they break down less corn and turn around quicker.

Hot weather affects the mule less than the horse.

A good, honest business mule is worth, and will command, a good price any day in the week.

The usefulness of a mule continues longer than that of a horse.

The mule is not handsome, doesn't make a good roadster, isn't stylish, doesn't "do himself proud" if hitched to a fancy yellow wagon or cart, but what he lacks in appearance he makes up in actual usefulness on the farm.

As is well known mules are the progeny of a cross between jackasses and pony mares. The progeny of the converse cross are called hinnies. The latter are not much bred in England, though in Ireland they are produced in comparatively large numbers. The mule foal should be halter-broken at a very early age; in fact, some advocate putting short halter on at six months, for a great deal depends upon the way the colt is broken to the bridle, and how he is handled when young. Mexican mule drivers usually are on very good terms with their animals, and in the Southern states the good understanding between mules and their colored drivers is so pro-

verbial that many people believe there is some affinity between them. It is universally admitted that the working life of a mule greatly exceeds that of a horse, and their hardy nature renders them far superior to the latter animal in pack work for the mines and townships in mountainous districts. For many years this was the mode of transit for goods to and minerals from the tin mines and other places in Northern Queensland, and the "little beasties" were marvels of pluck and endurance. They last longer than horses, mules at 30 years being about equal to the horse at 20 years. In France the mule colts are made to earn their living at a very early age. They are worked on the farms from the time they are 18 months old until they reach three to four years, when they are sold to dealers, who distribute them again in Spain, Italy, and other countries; but the work must be very light, otherwise the colts would be spoiled, as a mule is scarcely full-grown at five years; and is not fully up to hard work until he is six or seven.—Queensland Country Life.

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THE INTERNATIONAL CABLE NETWORK.

The Nachrichten fur Handel und Industrie, Berlin, September 17, 1900, quotes from the Swiss Official Gazette, as follows:

The entire cable network of the world is composed of 1,460 lines, with a total length of about 192,634 miles, of which 1,142 lines, with a length of 22,867½ miles, were under government management; the remaining 318, with a length of 169,021 miles, belonging to private companies. The total value of this cable network is estimated at $1,190,000,000.

Countries and Companies	No. of Cables.	Length Miles.
Germany	59	3,616
France	78	19,390
Great Britain	358	112,896
British India	3	2,374
British America	1	1,056
Bahamas	1	245
Australia and New Zealand	31	397
English-American Telegraph Company	15	14,130
United States	22	21,131
Russia	9	264

North Danish Telegraph Company	24	8,025
Japan	70	1,734
East Asia	12	2,048
Northeast sea states, Denmark, Sweden, Norway, Belgium, Netherlands	438	839
Spain	15	1,084
Italy	29	1,221
Other countries	178	2,184
Total		192,634

—U. S. Consular Reports.

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PREDICTING STORMS.

Among the many priceless gifts which science has poured into the yearning lap of the last generation is the banishment of superstition. Our fathers planted by the moon, watched it for weather signs, were seriously perturbed at the thought of ghosts, and paled before the thought of beginning a piece of work on Friday. Science has shown that most if not all of these old superstitions are utterly baseless. Our Weather Bureau is working along scientific lines. And so barring necessary mistakes is worthy our confidence. The so-called weather prophet is a quack, has no science to build upon, and so should gain no heed or favor anywhere. It is possibly true that some good people feel towards our government weather predictions as we all should toward the quack, who, with no scientific data, essays to foretell the future of the weather.

The U. S. Government forecast is rapidly gaining the confidence of all, as real success always must and always will. Our knowledge of atmospheric disturbances is as yet too meager to make infallibility of prediction possible. The present accuracy, however, is remarkable. We are all the while gaining more and more accurate knowledge of the laws of atmospheric disturbance. In consequence of this forecasts are all the time coming to be more certain of fulfillment. Already these forecasts are invaluable to commerce, and to agriculture; their promise is still more felicitous and encouraging.

The great truths on which United States weather predictions are based are the determined courses of the great wind

drift movements in our north temperate and torrid zones. We now know of a truth that there is a constant movement of the air in great circles which in turn move in a more or less varying course eastward. These cyclonic movements pass from California to the East, then across the ocean to Europe and then over the continent till the Pacific is gained; then that great water is crossed and California is reached, only to again begin the circuit. Thus in ceaseless round these cyclonic movements are ever speeding their way to the eastward on our great continental area. We have all seen a little whirl of wind. We note its circling movement by the dust whirl which it causes. We also see it push onward in nearly right lines, evidenced by the same dust cloud. The great circumpolar cyclones are like the little whirlwind, only they are often more than 1000 miles in diameter, and ever push eastward—sometimes with rapidity, often with very little speed, so they seem almost to be at a standstill. The circular motion may also be prodigious. As intimated above the course may not be wholly eastward. They may veer to the south or to the north, but are ever going eastward. They may take a week to traverse our continent from the Pacific to the Atlantic.

There are two marked kinds of these cyclones: The cyclonic, which moves from right to left or contrary to the hands of the clock. This is always attended with a low atmospheric pressure, and the air rises constantly in the great whirling vortex. The other is the anti-cyclonic, which moves with the clock, shows a high barometric pressure, and the air in the vortex comes rushing down from above. We readily see why the first is a storm breeder, the latter a bearer of brightness and sunshine; while the former brings the storm cloud, the latter is the harbinger of clear skies. The first bears moist air currents, which are shot upward, cooled and made to drop their load of water often in great cloudbursts. The anti-cyclone, on the other hand, draws down the cool, dry air, and so the storm is not and the weather is fine. The cyclonic drift lifts the air and gives a low barometer, the anti-cyclonic draws it down and of necessity gives a high barometric pressure. We can readily see also why temperature is affected as it is. Suppose the cyclonic drift has its center at Chicago. All west, of course, has a northerly wind, which must be cold, as it is coming from the cold north, and thus it is not

difficult to presage truthfully not only the storm but the cold wave as well. All east will have a warm, southerly wind to be followed as the cyclonic center moves eastward, by a cold north wind. If the barometer was high then it would be an anticyclonic drift. The skies would be clear, and with Chicago as a center, the cool north winds would be to the east and the warm ones to the westward. These latter would be northerly, as the anti-cyclonic whirl is with the hands of the clock.—Cal. Cultivator.

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CULTIVATION OF SUGAR CANE IN QUEENSLAND.

(Queensland Agricultural Journal.)

A paper by Mr. E. Denman, of Mackay, read at the Agricultural Conference held at Warwick, Queensland. * * * The chief object I have in view is to try and impress upon the minds of our cane farmers especially the great value of soil moisture conservation. Perhaps we know a good deal about irrigation, but we have a great deal more to learn, and I will dismiss it from my paper, as it is beyond both the means and expectations of most of us. No good can come of dealing with the unattainable, and at gatherings of this kind it is best, whether dealing with faults, or omissions, or remedies, to deal only with those which can be charged to the farmer himself, and which he can, if he chooses, remedy himself.

Whatever may be said of the value of nitrogen, phosphoric acid, potash, lime, stimulants, and fertilizers, they are all valueless if one element is lacking—namely, moisture; and it is in every farmer's power to conserve moisture in a remarkable degree at little cost and large profit to himself, and thereby reduce our present crop variations of from 40 to 60 to 10 or 15 degrees from normal. Dealing with soils first, I may say that I know of no sugar-growing country with such a wide variation. In almost all old cane-growing countries, the soil is uniform, whereas in Queensland you will find half a dozen distinct soils under cane on the one estate. Many place immense value upon soils of great depth. I have had experience of many soils, in several countries, and (especially for cane cultivation) I prefer a grey soil, fairly retentive, about 18 inches deep, with a clay subsoil, and I am confident with good and proper cultivation such a soil will, especially with our erratic climatic conditions, give both the best and most

regular return. Many farmers almost dread such a subsoil, saying it is too cold, &c., and will not let their plows touch it. But it is a storehouse upon which the farmer always can, and should, periodically draw, both by plow and with leguminous plants. The first step towards moisture conservation commences with tillage.

As to how many plowings land should receive, no rule can be laid down, but this much is universally admitted: That the cultivation must be thoroughly done, and all weeds thoroughly eradicated before the land is planted. Trusting to get rid of weeds by after cultivation is a great mistake, is rarely successful, and always much more expensive. Twelve inches is not sufficiently deep to cultivate land for a cane crop, and until I came to Queensland, I never saw it cultivated less than from 21 to 24 inches for the plant crop. The substituting of three horses for the old eighteen bullock team may be more expeditious, but it is much less profitable. I also think there is altogether too much talk about intense cultivation (whatever that term may mean), and too little attention given to rational cultivation and treatment of both soil and crop. Under our present system of cultivation our soils have lost much of their natural porosity, as well as their retentive power. Plans have been formed which are almost impervious to the roots, and 8 or 9 inches of soil has thereby to cope with twice its natural quantity of water, which reduces its temperature very considerably, and has other ill effects upon it. This can only be remedied by subsoiling. (I, of course, am presuming that draining is beyond the means of most of us.) The distance the rows should be apart, also that of the plants in the row, the varieties of cane and their peculiarities, I will not now touch on. I will simply say a few words about the plants themselves. My experience teaches me that in cane cultivation, the man who selects and cultivates his own plants is much more sure of getting a good, sound, suitable, and reliable cane for his land, than the one who pursues change and variety, which, besides being very expensive generally, gives disappointing, and not infrequently disastrous, results. Soil, climate, and treatment all effect canes.

In Mackay, the Bourbon succumbed to climatic or other influences in about five years, yet it has been grown continuously in other countries for over a century, and is still their favorite and most reliable cane. We know how imperative re-

liable labor is; a reliable cane is scarcely less so, and we have very good material to work on to obtain this, and I do not think that it has been to the interest of the sugar industry that certain first impressions were allowed to deepen into prejudice with regard to certain reliable and robust varieties. It is an almost universal complaint in Queensland that there is always a very large percentage of misses in May plantings. Many planters have yet to learn that a plant may be quite healthy, and the eyes thereof quite sound, and yet it is utterly unfit for planting; and if the consequence of their use were only the large number of misses, it would not be so bad, but there are much more serious results therefrom. There is a very common impression that cultivators were designed to keep down weeds. They do this very effectively, but this primary use is to keep the soil for as long as possible, during the growth of the crop, in the same state as when the crop was planted. I shall not go into the benefits of moulding and the ill-effects of hilling up cane, &c., but will briefly refer to trashing. Many still think that the primary object of trashing cane is to ripen it. This view is entirely wrong. The object is to let in light and air, which are essential to growth. "But trashing does not benefit the farmer," was a remark made to myself only last week. If trashing is properly done, and at the proper time, the farmer is the very man it does benefit in many ways.

There is another very common, yet erroneous, impression also held by many—namely, that the chief harm in weeds lies in the nitrogen, &c., of which they rob the land. Their chief harm is in the immense amount of moisture they take from the soil. Many justify themselves in burning trash by saying that it harbors grubs. I never burn trash. I have now under cane about three-quarters of an acre which is surrounded by a fringe of undergrowth. No trash has been ever burnt off it, and the fourth crop is now growing. From this undergrowth last year, I caught 50,000 beetles; yet I have never lost a single stool of cane from grubs on the piece alluded to. Burning trash not only destroys valuable plant food (for it represents more than 50 per cent of what actually comes from the ground), but the firing helps to free the nitrogen from the soil also. Periodically, what is deemed a discovery is made which is to be the salvation of the sugar industry. We have one just now; the agent is sulphate of ammonia. It is, however,

by no means new, but rather the reverse. It is about the oldest and largest used stimulant for sugar-cane known. Unfortunately, it is capable of producing most misleading results, and, had it been applied to cane lands generally in the Mackay district at the time it was used in the experimental plot, the general results would have been only most discouraging, but the conclusions would have been most fallacious. To claim that it will overcome drought is a great fallacy. Drought overcomes it, for, without moisture, sulphate of ammonia is useless, if not harmful. Its value, as you are all aware, lies in its nitrogen, and, valuable and necessary as nitrogen is to plant growth, I fear that in Queensland it has been allowed to overshadow other equally necessary and valuable elements, such as phosphoric acid, and especially potash. Many of you, whether cane growers or cereal growers, have had the misfortune, perhaps too frequently, to plant a field which absolutely failed to grow. The same field plowed out and replanted next year under more genial conditions grew splendidly. Yet there was exactly the same amount of nitrogen in the soil of that field when it failed to grow as when it grew luxuriantly. What was lacking was moisture; and if sulphate of ammonia had been applied to the first field, it would have produced no results, whereas, had it been subsoiled, in all probability the crop would have, even under adverse climatic conditions, been very fair.

I do not think, either, that the chief value of leguminous crops is the nitrogen they secrete. Were that so, I think I could supply the same amount of nitrogen in an artificial form much cheaper, better, and quicker than by planting those crops. They have the power to fix atmospheric nitrogen, and store it, but I think that the potash they obtain from the subsoil is equally valuable, and that their greatest value is in the immense amount of vegetable matter of humus with which they enrich the soil, supplying both plant food, and rendering the soil much better able to conserve moisture. The chief drawback with our old sugar lands from which trash has been regularly burnt, is, not that they have been denuded of nitrogen, but rather of vegetable matter. I fear that the scientific knowledge of many cane growers greatly exceeds their practical experience. It cannot possibly benefit the farmer to know what his soil contains if he has not the knowledge to enable him to unlock the combinations and

render them available for his crop. The thoroughly practical farmer can, and does, as a rule, obtain much more from poor land, by proper cultivation and treatment, than the mere scientist does from a much more fertile soil. There is much more to be said on these matters, but experience has taught me that an industry may be in the hands of most capable men, and still not flourish. Mr. Chamberlain, referring to this very industry lately, said: "You cannot introduce new energy and capital unless you give stability to the industry." With the terrible uncertainty which even now hangs over the future of the sugar industry, it is not to be wondered that energy and capital are almost dormant.

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FEEDING THE ORIENT.—OPENING FOR FARM PRODUCTS IN THE FAR EAST.

People yellow and brown are coming in crowds to trade at Uncle Sam's shop. The folks of the Orient want our goods, and they are buying more of them every year. Our exports are turning westward, and the rate at which our commerce across the Pacific has been growing lately is astonishing. In 1899 we shipped 1,000,000 barrels of wheat flour to Hongkong alone, and China and Hongkong together bought of us upward of 60,000,000 gallons of kerosene. If things keep on as they are going now, we shall soon be clothing all of eastern Asia, as well as a large part of Oceanica. We disposed of $10,000,000 worth of manufactured cottons in that part of the world last year.

J. J. Hill, the railroad owner and capitalist, is now building with the utmost possible expedition a line of steamships to carry freight across the Pacific. I understand that there are to be about a dozen of these vessels, which will be the largest freighters in the world—very broad and deep and of enormous tonnage. They will be slow, speed being sacrificed for stanchness and capacity.

In these huge craft immense quantities of grain, harvested in the middle West, will be transported to China and Japan, as well as other products, such as cotton. A part of the scheme laid out by the proprietor is to connect this line of steamers with railways which he controls in this country in such a way as to ship goods from the Eastern part of the United States to the other side of the Pacific direct, without transfer

to or from other companies, making a through rate exceptionally low.

Raw cotton, as you probably know, is our most important article of export to Japan, China and Hongkong. It goes chiefly to Japan, where at the present time our cotton is competing formidably with the raw product of China. In China we are competing with Japan the sale of our manufactured cotton goods. It is a rather curious situation, one may say, promising profit both ways to Yankee producers.

The raw cotton that we send to the Orient is utilized mainly in the weaving of light, tropical fabrics, which are worn all over Southern Asia and in Oceanica. India, and Southern Russia buy our cotton because of its superior quality, and on this account it has driven out the Chinese cotton to a considerable extent in Japan within the last four or five years, notwithstanding the fact that it costs more.

It is by making the freight route continuous across the United States and Pacific ocean, as it were, with a comparatively low transportation rate, that the new steamship line expects to make profitable the carrying of wheat from the middle West to China and Japan. The idea at first entertained was to construct comparatively small and very swift vessels, which should be able to convey perishable agricultural products to Oriental markets in the shortest possible time.

The plan was rejected, however, and provision for the preservation of such products during the passage will be made by the introduction of cold storage apparatus on a large scale in the hold of each ship, ammonia gas being utilized for refrigeration. In this manner our fruits and doubtless, considerable quantities of our vegetables, will be delivered in a fresh condition on the other side of the Pacific.

We sent about 1,200,000 barrels of wheat flour to China, Hongkong and Japan in 1899. The bulk of it went to Hongkong—a great entrepot through which American goods of various kinds are distributed over a large part of China and the archipelagoes of the Southern Pacific. I may mention incidentally that some of our wheat is now being milled in Japan and China.

Next after raw cotton, our most important export to the Orient is kerosene oil, of which we shipped to that part of the world last year about 74,000,000 gallons. In the last de-

cade our exports of kerosene to the East have much more than doubled.

We sent to China and Hongkong last year $50,000 worth of condensed milk, for which there is a growing demand in that part of the world. The Chinese have taken to it with avidity, eating it as a sweetmeat, and regarding it as a great delicacy.

For our eggs and butter, too a market is springing up in those parts, and it seems to offer attractive possibilities. The patriotic American hen may yet lay the basis of an important trade in the Orient. Foreigners criticise unfavorably our methods of shipping eggs, claiming that the crates we use for the purpose are unsuitable and cause breakage. If they are correct, we shall soon find it out and do better.

As for butter, the department of agriculture is at present engaged in making experimental shipments across the Pacific, as well as over the Atlantic, in various kinds of packages, so as to find out what style is best adapted to the foreign demand. Results are as yet incomplete, and so we have not formed our conclusions. The packages we are using chiefly in these trials is a modification of the Australian butter box, cubical in shape and tapering slightly toward the base. It holds fifty-six pounds, or just half an English hundredweight. Other countries have made it their practice to export butter by the hundredweight, and that is why we have adopted receptacles of such a size. Some fancy butters we are sending over seas in small parcels, hermetically sealed, to see if they will not attract the foreign purchaser.

Seventy-five per cent of our exports to Hongkong are farm products. Last year we shipped to that port over $4,000,000 worth of wheat flour, $46,830 worth of canned fruit, $20,841 worth of beans and peas, $9,026 worth of green or ripe apples, $8,464 worth of canned vegetables and $6,503 worth of butter.

To sum up, our trade across the Pacific is growing at a wonderful rate, and holds out most flattering prospects for the future. The sugar producers of the Hawaiian Islands look to us today for all they consume, except sugar. They even buy their vegetables on our Pacific coast. A large part of the cotton produced in our Southern States finds a market around the gulf of Pechili, and in other parts of China.

Lately we have been furnishing ties for the railroads of Asia. Canned goods from our packing houses are going to

China and Japan in large quantities, and the wheat growers of the middle West will soon have a market in the Orient.

The farmers of the Eastern States have every reason to be keenly interested in the movement of Western farm staples across the Pacific, inasmuch as this new business will lessen the keen competition under which they have labored ever since the railroads reached the Mississippi valley.

JAMES WILSON,
Secretary of Agriculture.

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PURE FOOD BILL.

Following are the main provisions of the Pure Food bill in the United States Senate:

Section 1.—Any person, company, or corporation who shall manufacture, sell, or offer to sell, ship, or deliver for shipment any article of food, or any article or compound intended to be used in the composition or preparation of food, in which article or compound there is, as added ingredient, any chrome yellow, coal-tar dye, colorine, formaldehyre, fluoride, salicylic acid, sulphuric acid, ammonia, alum, copper salts, zinc salts, or terra alba, within the District of Columbia or the Territories of the United States, shall be guilty of a felony, and, upon conviction, fined not less than five hundred dollars nor more than two thousand dollars for the first offense, and for each subsequent offense fined not less than two thousand five hundred dollars nor more than ten thousand dollars, or be imprisoned not less than one nor more than five years, in the discretion of the court.

Section 2.—That any person, company, or corporation who shall introduce into any State or Territory or the District of Columbia, from any other State or Territory or the District of Columbia, or from any foreign country, any such article, or any person who ships or delivers for shipment, to any State or Territory, or to the District of Columbia, or to a foreign country, or who shall receive or deliver, or who shall sell, outside of the State in which the same was manufactured, any such article, shall be guilty of felony, and shall be, upon conviction, fined not less than five hundred dollars nor more than two thousand dollars for the first offense, and for each subsequent offense fined not less than two thousand five hundred dollars nor more than ten thousand dollars, or be

imprisoned not less than one nor more than five years, in the discretion of the court.

Section 3.—That any such article which is being transported from one State or Territory or the District of Columbia to another State, Territory, or the District of Columbia, or has been sold or offered for sale in the District of Columbia or the Territories of the United States, or imported from a foreign country, or be intended for export to a foreign country, shall be liable to be proceeded against in any district court of the United States within the district in which the same is found, and to be seized for confiscation and destruction by a process of libel for condemnation; and all such proceedings shall be at the suit of and in the name of the United States.

Section 4.—That the Secretary of Agriculture shall have charge of the enforcement of this act, and of the procuring and examining of samples of articles of food and articles or compounds intended to be used in the preparation of food.

Section 5.—That if it shall appear from the examinations that the provisions of this act have been violated, the Secretary of Agriculture shall certify the facts to the District Attorney, whose duty it shall be to cause proceedings to be begun and prosecuted without delay for the fines and penalties. Any citizens or district attorney may proceed independently for any violation of this act. All fines collected shall be apportioned among the agricultural colleges of the several States.

The Senate Committee on Manufactures, to which this bill was referred, has voted to report it favorably, and an extended discussion in the Senate developed a strong sentiment favorable to its passage.

In view of the probability of the enactment of this or similar legislation, grocers who are affected by it should look carefully to their stock on hand not only, but refrain from buying any of the articles which, after the law goes into effect, will become contraband, and the sale or possession of which will make them liable to heavy fines and penalties.

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THE PINEAPPLE SEASON.

One week from Saturday last, says the Times-Union and Citizen, headquarters of the Indian River and Lake Worth

Pineapple Growers' Association at the Plant System wharves, will cease for the season, and the general agent, E. P. Porcher, will return to Cocoa, his headquarters for the remainder of the year. The shipping is now practically wound up; there will not be more than 2,000 crates more sent forward. This is, of course, for the east coast pines; while the shed-grown pines or Orlando and those of the west coast are now just coming into market. But with these this association has nothing to do.

The association, during the term that the headquarters have been in Jacksonville, has handled about 52,000 standard crates, for which there has been obtained about $2 per crate net to the growers. The fruit has been scattered from Boston to Omaha, and from Canada to New Orleans, and there has never been but one glut anywhere within the range of the association shipments, and that a slight one, caused by hot weather and by aimless shipments outside of the association. In fact, for the Red Spanish variety the demand has been so steady and active that it can truthfully be said that there has hardly ever been enough. Mr. Porcher stated yesterday that there has not been a day since the season opened, taking in the whole range of the pineapple markets supplied by the association, where it could not have placed eight or ten as many carloads as it was able to supply, and he could place that number today, when the season is practically ended.

There is a distinct demand for the Red Spanish in the American markets. Consumers know this variety and call for it; and the fancy varieties are comparatively neglected. The Porto Rico has done fairly well, but the Abakka has not come up to expectations, even in Boston, which was thought to be an Abakka market.

About 35,000 standard crates have been sold in the field or at the depots on the Indian river and Lake Worth, for which the prices obtained ranged from $1.50 to $2.25 per crate. It will not escape attention that this is a result really better than that obtained by the association; but the general agent mentioned it with satisfaction as being a result which he has worked for, because it is beneficial to the growers. He does not hesitate to claim that the association was largely influential in securing these good sales in the field, because it was controlling and shipping so large a percentage of the fruit that it forced the commission men, outside of its agencies, if they wanted any fruit to go to the growers to buy it. Association sales and home sales dovetail admirably together, each supplements the other, each is necessary to the other.

The total crop on the mainland has been about 130,000 standard crates. In this estimate, 87,000 crates have been accounted for, leaving about 43,000 crates to be disposed of otherwise. These were shipped outside of the association,

and of course nothing more than a rough approximation or a guess can be given in regard to them. The fact that these shipments were necessarily made without any oversight from a central directory caused some of them to be bunched, producing glutted markets. These undirected shipments sometimes ran against association pines, sometimes against those that had been bought in Florida and shipped by the buyers. The gluts were infrequent and light, because there were not nearly enough pines in Florida to go round; but they show what might happen if Florida had several million crates to dispose of.

The time made by the trains and the condition of the pines on arrival have left nothing to be desired. Two days from Florida to New York and three to three and one-half days to Chicago have been the rule; very seldom a longer time than that. The railroad service all over the country has been almost perfect. The pines have gone through to nearly every point, East or West, from twelve to fifteen hours quicker than in former years and in splendid condition.

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STORY OF THE SEEDLESS ORANGE.

Twenty-five years ago there were no seedless, or navel oranges grown. A few oranges were raised in Florida, but the bulk of the supply came from the Mediterranean, and the fruit was expensive. The annual yield of California oranges was less than five carloads. Now the annual orange yield in California is upward of 15,000 carloads, and the total amount invested is now something like $43,000,000, while twenty-five years ago it was only $23,000. The introduction of the seedless or navel orange has caused these changes. It has revolutionized the orange industry of the United States, drawing 13,000 men out of other pursuits, and has transformed vast areas of sunbaked land in California into beautiful orange groves.

The first seedless orange trees were apparently freaks of nature, writes a Californian correspondent of the New York Sun. Their counterparts have never been found. In the summer of 1872 Wm. F. Judson, United States Consul at Bahia, Brazil, heard an account from natives of a few trees in the swamps on the north bank of the Amazon some 60 miles inland that bore oranges without seeds. He was of scientific bent and a Consul that knew his business. He had heard of the starting of orange groves in Florida, and he believed that seedless orange trees were well worth experimenting with there. So he sent a native up the river to cut some shoots of the trees and get some of the fruit. When the native returned the Consul was delighted with the specimens. Forthwith he sent six of the orange tree shoots, carefully packed in wet

moss and clay, to the Agricultural Department at Washington for propagation. The trees did not excite as much attention in the Department as the enthusiastic Consul had expected. Two of the shoots, which were no bigger than horsewhips, died from lack of care in the Department grounds, and the others were almost forgotten in a few months.

In the winter of 1873 Mrs. Horatio Tibbetts, a native of Maine, was visiting the family of her cousin, Gen. Benjamin F. Butler, then a Congressman from Massachusetts. Her husband had recently removed from Boston to Los Angeles, Cal., and was about to preempt a tract of Government land in the San Bernardino valley. The scheme was an uncertain one, but anyhow he intended to grow semitropical fruits there. He asked Mrs. Tibbetts to get from General Butler an introduction at the Agricultural Department. She was then to ask for specimens of fruits and shrubs suitable for experimental propagation in Southern California. Among other things, Mrs. Tibbetts got from the Department grounds the four surviving orange-tree shoots from Brazil. These trees reached Mr. Tibbetts at Riverside, Cal., a week later, and were immediately planted. That was in December, 1873. One of the shoots died from neglect and another was broken and chewed up by a cow.

Five years passed and the two surviving trees came into bearing. In the winter of 1878-79 they bore 16 oranges, the first seedless oranges ever grown in North America. The specimens were carried about Southern California and shown to all ranchmen and fruitgrowers. There were many who doubted whether the trees would annually bear such royal specimens of orange culture. Nearly everyone believed that the fruit would become coarse and tough in a few years more. So the second crop was awaited with curiosity among the neighbors. There was about a box of oranges in the second yield, and they were even better than those of the first crop. The fame of the Tibbetts' seedless oranges went far and wide in Southern California. People who were growing the old-fashioned oranges travelled hundreds of miles in wagons to see the trees. Still, there were less than half a dozen people who believed that such a freak as a seedless fruit could ever be propagated into an established industry.

Mr. Tibbetts was sure that there was a fortune in his new variety or oranges. For two years, he experimented with propagating trees from shoots and cuttings from his two seedless orange trees. But all his attempts were failures. Finally, he hit upon the scheme of budding from the seedless navel trees upon seedling trees. Experiments along that line were successful. It was found that a bud taken from one of Tibbetts' two navel orange trees and grafted into the bark of a seedling tree would grow to be a limb which bore seedless

navel oranges. Then, Mr. Tibbetts grew tiny seedling orange trees, just as had been done by orange-growers for ages, and budded into the trunk of each little tree several navel orange buds. When the buds had become branches of the trees, he cut away all the original or seedling branches, leaving only the navel orange branches to bear fruit. In this way, he easily created navel orange trees, and the problem of growing seedless oranges was solved.

The planting of groves of seedless orange trees propagated from buds from the two original trees on the Tibbetts' place began in earnest throughout Southern California in the winter of 1882. In the following year the demand for buds from the Tibbetts' trees was so large that a dozen buds sold frequently for $5, and some growers, desirous of getting navel orange buds of genuine quality, paid $1 each for buds. In 1884 the two Tibbetts' trees furnished buds that sold for $1,500, and a tall fence was built about them to keep people from stealing buds. A year or two later the orange trees that had been propagated from the Tibbetts' trees began to bear, and they themselves furnished tens of thousands of navel buds as good as those from the two original trees. Then the first navel orange groves began to bear fruit, and from that time the boom in navel orange groves has continued. No one plants seedling orange trees now-a-days, and tens of thousands of seedling trees have been budded into navel orange trees. The average returns from seedling orange groves in Southern California during the last ten years have been less than $100 an acre, while there are many navel orange groves in this region that have yielded net profits of $250 and $300 an acre a year.

The two trees from which have come directly and indirectly all the navel oranges in the world are still on the old Tibbetts' ranch in Riverside. Since Mr. Tibbetts received the shoots from the Agricultural Department and began propagating the first seedless oranges, Riverside has grown from a hamlet of less than 30 American residents to a beautiful, prosperous city of 14,000 population, with an assessed valuation of $8,275,000. It is the greatest orange-producing locality in the world. Some 16,000 acres of land are devoted to orange growing. The average annual shipments of oranges from Riverside are 1,600,000 boxes, valued at $2,100,000. All this has come from the introduction of Tibbetts' seedless navel oranges, and just now the Riverside Press and the leading citizens of Riverside are urging that the two trees should be removed to the public park and surrounded by an iron fence, so that the interesting history of the seedless navel orange may be the better preserved in another generation.

TEMPERATURE AT HONOLULU, HAWAIIAN ISLANDS, U. S. A., FOR 1900, W. R. CASTLE, OBSERVER.

Day of Month.	Jan.			Feb.			March			April			May			June			July			Aug.			Sept.			Oct.			Nov.			Dec.		
	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	6 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.
1	65	77	66	68	77	70	69	76	68	70	78	72	70	78	71	70	84	73	75	87	76	72	87	76	75	85	76	70	86	77	73	80	71	71	79	72
2	65	76	65	67	78	70	67	77	70	72	83	73	70	78	71	69	83	74	72	86	76	74	87	76	75	86	77	75	83	76	71	78	73	69	81	74
3	62	75	68	62	78	66	69	78	68	70	82	73	70	78	72	70	83	73	72	86	75	71	87	76	76	85	77	75	80	74	67	75	67	68	80	68
4	60	75	67	69	77	69	65	78	69	69	84	72	71	82	73	67	84	74	72	87	76	75	89	78	75	86	76	74	84	76	70	76	70	68	81	72
5	62	75	62	64	73	66	62	79	70	68	83	74	72	79	74	69	84	75	73	85	73	76	88	79	74	86	76	73	80	75	69	79	72	72	77	71
6	60	75	69	66	73	69	66	78	72	72	82	73	72	81	72	72	85	75	72	87	75	74	85	78	73	86	75	72	80	72	70	79	72	69	77	73
7	69	77	73	67	76	68	67	80	72	71	83	74	71	80	72	70	85	74	73	87	76	76	87	79	74	86	76	69	84	70	71	77	68	71	76	70
8	69	75	70	66	77	66	69	81	70	68	83	72	71	80	71	70	85	74	74	86	77	76	85	78	75	86	76	68	83	76	64	79	72	63	78	71
9	63	79	68	63	77	68	61	79	67	68	79	69	71	81	72	71	84	73	75	85	75	73	83	77	75	87	75	70	83	73	73	76	72	69	75	70
10	70	79	73	63	75	67	59	76	69	68	75	69	70	78	71	69	84	74	74	82	74	74	86	76	73	87	74	71	82	74	71	76	71	66	75	69
11	70	78	72	62	73	65	64	76	71	69	81	73	70	81	71	72	85	76	73	84	76	75	83	75	73	85	76	74	87	76	69	73	71	69	74	71
12	71	78	71	56	74	64	72	78	67	71	81	72	68	82	69	71	83	74	72	86	77	74	85	77	74	87	78	72	84	75	71	77	68	72	78	73
13	70	78	72	58	76	64	58	77	68	72	82	72	69	82	73	73	85	76	74	87	74	75	85	74	77	86	77	72	84	72	71	77	68	71	78	74
14	67	77	71	59	76	66	62	78	66	66	84	71	69	78	71	75	87	76	72	87	75	71	84	76	75	86	78	70	83	69	68	75	67	72	79	67
15	69	78	71	66	71	66	61	78	72	72	83	72	71	83	74	75	87	76	73	84	75	72	85	76	75	86	78	66	84	73	75	79	72	71	79	73
16	66	72	67	65	74	68	66	80	71	65	74	68	70	82	72	74	85	75	73	86	75	69	87	75	75	85	74	75	80	72	72	76	71	71	79	72
17	67	72	67	62	80	72	66	78	71	66	75	67	72	83	73	75	86	77	71	86	76	71	87	79	73	86	77	75	82	76	71	82	77	62	78	64
18	66	75	69	70	80	69	67	78	72	63	74	69	70	82	73	73	85	77	74	85	76	78	84	79	75	85	77	76	83	75	75	81	76	62	73	70
19	68	76	68	64	79	65	71	79	72	68	74	69	68	84	71	72	86	76	75	85	75	78	87	79	76	85	77	74	83	76	76	81	72	68	79	71
20	68	78	72	64	79	66	71	78	72	70	75	71	68	83	73	72	85	76	70	86	75	77	85	78	75	84	75	74	82	74	68	81	70	68	79	68
21	69	77	69	62	78	71	70	78	73	68	81	71	74	83	75	74	86	76	71	85	76	76	82	75	72	83	75	70	76	75	69	81	72	64	77	69
22	66	77	68	66	82	68	71	77	72	68	79	71	75	82	74	73	88	77	73	87	76	74	84	76	73	84	76	74	79	76	68	81	72	68	78	70
23	61	77	67	65	79	67	71	78	72	66	77	70	73	83	71	74	82	75	75	86	77	73	83	76	73	83	74	76	80	75	69	79	73	67	78	72
24	66	75	68	62	79	68	71	78	72	68	81	71	72	82	75	73	87	76	76	85	76	75	84	77	71	83	73	73	79	73	72	78	76	73	79	68
25	61	74	65	64	80	68	71	78	71	67	80	68	71	81	73	74	86	75	76	86	75	74	87	78	71	84	76	74	82	76	70	75	71	67	76	71
26	61	70	66	67	80	70	69	80	72	65	81	68	72	81	73	74	85	74	72	84	73	76	86	78	75	85	76	74	78	75	71	73	72	70	75	68
27	61	74	68	70	80	72	70	81	71	65	80	68	72	84	74	73	80	75	74	86	77	77	85	78	73	86	74	74	80	74	70	78	72	65	74	66
28	68	76	66	68	77	70	69	79	70	65	77	70	70	82	73	75	85	76	75	86	75	76	85	77	76	85	75	74	79	74	69	79	72	61	71	65
29	60	74	67				64	79	69	63	78	67	68	84	74	76	87	77	76	87	78	77	83	77	70	84	75	73	81	76	72	80	70	63	76	66
30	66	74	68				66	78	68	63	79	69	74	86	75	76	87	77	75	87	78	74	86	74	69	85	74	74	80	75	67	80	73	56	72	67
31	66	74	68				63	77	70				71	84	73				72	84	74	77	86	77				72	79	76				61	72	67

Observation taken at 50 feet above sea level, Maximum, 89; Minimum, 56; Average, 72.05.

RECORD OF THE RAINFALL AT HONOLULU FOR THE PAST SEVENTEEN YEARS.

From Daily Readings at the Residence of Mr. W. R. Castle. (Elevation 50 feet.)

Months.	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900
January.....	1.07	.06	.38	5.85	.78	.87	2.00	1.19	6.50	2.57	3.08	2.38	2.20	.94	3.97	0.87	.41
February....	1.68	.67	.94	13.04	1.98	.77	9.85	4.84	3.18	13.45	12.42	1.81	1.30	.79	7.60	3.55	.93
March.....	4.06	2.96	1.63	2.24	2.25	.38	7.83	.69	.29	.75	1.51	1.46	3.11	1.20	9 66	3.73	1.30
April.....	3.52	5.11	1.19	2.35	2.36	.94	4.84	.88	1.60	2.22	.25	1.01	2.40	.93	1.26	.81	4.08
May	.44	11.56	1.61	4.10	1.97	.81	1.20	.23	5.10	1.50	.10	.93	1.51	.96	.68	1.44	1.06
June	48	2.51	.63	.95	.47	.97	.86	.43	.67	.29	.59	.90	.78	.99	2.07	.86	.39
July.....	1.40	4.27	56	.67	.15	.48	1.30	.58	.53	.28	.45	.45	.00	.81	63	.11	1.65
August.....	.83	2.85	.43	1.02	4.22	1.16	1.00	.58	1.14	1.04	.08	1.41	1.33	.39	.58	1.04	1.40
September...	.32	1.17	2.26	.95	2.80	1.81	.60	.47	.42	.91	.56	2.15	.39	2.66	.15	.35	1.17
October	4.66	.03	1.84	.44	1.31	.95	1.36	3.62	3.10	.64	1.76	.41	2.04	1.61	.52	3.70	7.08
November ...	.54	1.40	8.74	1.84	3.39	1.50	1.80	.39	.35	8.33	8.33	4.27	2.31	1.88	.50	.17	12.72
December ...	3.76	3.14	3 47	6.37	18.08	2.82	1.64	1.50	3.97	1.30	2.41	12.02	5.54	.51	.77	1.95	1.06
Total.....	22.76	35.73	23.68	49.82	39.76	13.46	34.28	15.40	26.67	33.28	33.54	29.20	22.91	13.67	28.39	18.42	33.25

Average for 17 years, 27.88 inches. Maximum, 49.82 inches; minimum, 13.46 inches.

HONOLULU STOCK AND BOND EXCHANGE, MAY 14, 1901.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co	$ 1,000,000	10,000	$ 1,000,000	$ 100	415
N. S. Sachs' Dry G'ds Co. L'd.	60,000	600	.....	100	100
L. B. Kerr & Co, Ltd	200,000	4,000	.....	50	.....
SUGAR					
Ewa Plantation Company	5,000,000	250,000	5,000,000	20	28
Hamoa Plantation Company	175,000	1,750	175,000	100	.....
Hawaiian Agricultural Co	1,000,000	10,000	1,000,000	100	310
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	80
Hawaiian Sugar Company	2,000,000	100,000	2,000,000	20	40
Honomu Sugar Company	750,000	7,500	750,000	100	172½
Honokaa Sugar Company	2,000,000	100,000	2,000,000	20	33¼
Haiku Sugar Company	500,000	5,000	500,000	100	.....
Kahuku Plantation Company	500,000	25,000	500,000	20	25½
Kihei Plant. Co. Ltd, Assess.	1,500,000	30,000	1,425,000	50	11
Kihei Plant. Co. Ltd, Pd. up	1,000,000	20,000	1,000,000	50	12
Kipahulu Sugar Company	160,000	1,600	160,000	100	.....
Koloa Sugar Company	300,000	3,000	300,000	100	.....
Kona Sugar Company	500,000	5,000	500,000	100	.....
McBryde Sug. Co. L'd. Assess	1,850,000	.....	1,036,000	20	7
McBryde Sug. Co. Ltd. Pd up	1,650,000	.....	1,650,000	20	12
Nahiku Sug. Co. Ltd. Assess.	675,000	33 750	.....	20	.....
Nahiku Sug. Co. Ltd. Pd. up	75,000	3,750	.....	20	.....
Oahu Sugar Co	3,600,000	36,000	3,600,000	100	155
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	30
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	18
Olaa Sugar Co. Ltd., Assess.	2,500,000	125,000	865,000	20	5
Olaa Sugar Co. Ltd., Paid up	2,500,000	125,000	2,500,000	20	15
Olowalu Company	150,000	1,500	150,000	100	.....
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	.....
Pacific Sugar Mill	500,000	5,000	500,000	100	.....
Paia Plantation Company	750,000	7,500	750,000	100	.....
Pepeekeo Sugar Company	750,000	7,500	750,000	100	.....
Pioneer Mill Company	2,250,000	22,500	2,250,000	100	102½
Waialua Agricultural Co	4,500,000	45,000	4,500,000	100	105
Wailuku Sugar Company	700,000	7,000	700,000	100	370
Waimanalo Sugar Company	250,000	250,000	250,000	100	155
Waimea Mill Company	125,000	125,000	125,000	100	90
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	100
Inter-Island Steam Nav. Co.	600,000	6,000	600,000	100	100
Hawaiian Electric Company	300,000	3,000	300,000	100	110
Honolulu R. T. & Land Co	250,000	2,500	250,000	100	.....
Honolulu Steam Laundry	25,000	250	25,000	100	.....
Mutual Telephone Company	150,000	13,900	139,000	10	9⅝
Oahu Railway & Land Co	4,000,000	40,000	4,000,000	100	105
People's Ice & Refrig. Co	150,000	1,500	150,000	100	85
BANKS					
First National Bank	500,000	5,000	500,000	100	.....
First Am. Sav. B. & Trust Co.	250,000	2,500	250,000	100	.....
BONDS	Amt. of Issue				
Hawaiian Govt. 6 per cent	2,924,200	Dec. 31, 1900	.....	.....	100
Hawaiian Govt. 5 per cent	1,251,200		.....	.....	92½
Haw'n G. Post. Sav. 4½ per ct	11,000		.....	.....	.....
Hilo Railroad Co., 6 per cent	450,000	.....	.....	....	97½
Hono. R. T. & L. Co, 6 p. c.	300,000	.....	.....	.....	.....
Ewa Plantation 6 per cent	500,000	.....	.....	.....	100
Oahu Railway & L'd Co 6 p. c.	2,000,000	.....	.....	.....	104
Oahu Plantation 6 per cent	750,000	.....	.....	.....	.....
Olaa Plantation 6 per cent	1,250 000	.....	.....	.....	.....